RETURN

(49)

RETURN to an ORDER of the HOUSE OF COMMONS, dated the 17th March, 1904, for a copy of the Report of Mr. McLeod, C. E., upon the continuation of the Trent Valley Canal between Rice Lake and Lake Ontario.

R. W. SCOTT,
Secretary of State.

GILBERT HOUSE, TRENTON, May 15, 1903.

COLLINGWOOD SCHREIBER, Esq., C.M.G.

I have walked over two lines for the Trent lanal from Rice lake to Port Hope.

The most direct passes over a high ridge, which I found to be approximately 129 feet above Rice lake. The cutting would extend from Rice lake for 3 miles, and would be from 70 to 136 feet deep. The rest of the line to Port Hope would be comparatively easy.

The second line passes through a depression in the ridge, about 2 miles further west. The cutting would be about 3 miles long, and about 70 feet deep, at the highest point. The rest of the line is comparatively easy, and would run into the first line about 4 miles from Port Hope.

I do not think it is necessary to cross the Grand Trunk Railway on the way in, and the canal would pass under the Grand Trunk viaduct at Port Hope.

Both lines would pass through some valuable farming lands, but the right of way through Port Hope would not be expensive.

The harbour at Port Hope is about half a mile long, and from 7 to 14 feet deep, besides an inner harbour of considerable size.

I am going to take some soundings in the Trenton harbour this morning, and will then go over the Trent river valley to the level of Rice lake.

HENRY A. F. MACLEOD.

OTTAWA, July 25, 1903.

COLLINGWOOD SCHREIBER, Esq., C.M.G.

Re TRENT CANAL, VIA PORT HOPE AND TRENTON.

I beg to report that in accordance with your instructions, I made an examination of the proposed routes for the Trent canal, from Rice lake to Port Hope, and also from Hastings to Trenton, during a portion of the month of May.

It was intended that I should make surveys of both routes, but this has not been done. The plans in the possession of the Department of Railways and Canals give sufficient information on which to make comparative estimates of the two routes.

On the 17th of June, you directed me to make comparative estimates of the two routes, which I have just completed. The estimates are based upon the plans in the department. Those for the Heeley's falls and Hoard's creek sections, were made by Mr. Rubidge in 1888 and those for the Trenton-Frankford section and the Rice lake and Port Hope, by Mr. Rogers in 1899 and 1900. All the estimates are made on the same scale, namely that adopted for the Trenton-Frankford section, and exhibited to contractors. The width of the canal at the bottom is 50 feet, widened occasionally for passing places to 100 feet—with slopes of 2 to 1 in earth, and $\frac{1}{4}$ to 1 in rock. Depth of water in reaches, 6 feet. The locks of concrete, 142 feet between the quoins, 33 feet wide at invert, with 8′ 4″ water on sills. The dams are all of concrete, with stop-logs.

I examined the entrance from Rice lake, of the Rice lake and Port Hope section, for several miles, and found that it is the best. The route adopted, is practically the same as that surveyed in 1834 by Robert A. Maingy, Mining and Civil Engineer.

I also took trial levels over a portion of two other more direct routes, but found that they passed over ridges, with cuttings from 125 to 136 feet in the deepest parts and extending about three miles.

Rice lake to Port Hope

There is no appearance of rock on this section, from Rice lake to within two miles of the harbour of Port Hope. I have therefore made no estimate for rock excavation, on that portion. For the same reason I put the price of concrete at $7 and crib-work at $4, while on the Trent section, where limestone rock is everywhere abundant, concrete is put at $6 and crib-work at $3.50.

There is a cutting three miles long and 68 feet deep at the summit, at the Rice lake entrance, which might prove difficult to construct and maintain.

To facilitate comparison, I altered two hydraulic lift-locks proposed, on this section, into two sets of ordinary locks, with three lifts each.

It is intended to construct a high level bridge for the Midland Railway, at the fourth lock and a swing bridge for the second crossing of the same railway in the Port Hope Electric Co.'s dam.

The canal will pass under the viaduct of the main line of the Grand Trunk at Port Hope. Swing bridges are provided for the existing roads, except in a few cases where they are diverted for short distances.

An estimate has been made for the right-of-way, including damage to buildings, &c., in Port Hope.

There is an artificial harbour at Port Hope about half a mile long, from 60 to 150 feet wide, and from 7 to 14 feet deep, with a basin adjoining of considerable size. It would be difficult to enter this harbour from Lake Ontario in rough weather, particularly with canal craft. A sum is included in the Estimates, for the purchase and improvement of this harbour.

Rice lake to Trenton.

A short distance above and below the lock at Hastings there is shoal water—an estimate has been made to remove the obstructions.

At Heely's falls, the canal is on the west bank of the Trent river, in cuttings through limestone rock, with water-tight walls of concrete, in part, and earth embankments.

The estimate includes a new dam at the head of the rapids, and a swing bridge for the road.

This canal connects Rice lake with Crow bay.

Hoard's creek section extends from Crow bay, where it leaves the Trent river, till it reaches it again at Parcy Reach, which is at the head of the still water formed by Chisholm's lock and dam.

The section leaves Crow bay at Middle falls, which is about a mile above Campbellford.

It is almost entirely in limestone rock cutting, with earth embankments and a concrete wall at the upper entrance.

A dam is provided for at Middle falls, also swing bridges for the roads, and for the Grand Junction Railway, near Hoard's station.

From Chisholm's lock to Trenton, still water is formed by a succession of dams to be constructed across the Trent river.

At Chisholm's lock an estimate has been made for partially rebuilding the lock, and for building a new dam across the river.

The estimate also includes swing bridges for the Ontario Central Railway, and the high-way bridge across the Trent river.

From Frankford to Trenton, the estimate has been made in accordance with the plans exhibited for contract. It is entirely in limestone rock. Provision is made for the dams—for alterations to the highway bridges at Frankford and Glen Miller, and for high level bridges for the Grand Trunk double track, the Gilmour siding, and high-way bridge at Trenton.

The Trenton entrance to the canal is large and ample—an estimate is included for piers.

I sounded the approach to Trenton harbour bay of Quinte, in the channel for about four miles, to the last buoy off "Nigger Island," and found that there was over 12 feet of water, the level of the bay being about 3 feet above low water.

Comparison of Routes.

From the examination made, it would appear that there is little difference in the cost of either route—the estimates show a difference of $144,537 in favour of the Port Hope route.

The difficulty of navigating Lake Ontario with canal boats, in stormy weather, is a serious objection to the Port Hope route.

The material for canal construction is better on the Trenton route, and the deep cutting on the Port Hope section is avoided by adopting the river route.

The diversion of water from its natural course, would be a source of great expense to the government—complaints were made that the water sometimes falls very low in the Trent river.

The largest public benefit would be obtained by constructing the canal through or near the towns of Hastings, Campbellford, Frankford and Trenton, where there are now large mills and factories.

A very large amount of water power, would be more available at the various dams on the Trent river than on the Port Hope route, and would be a valuable asset for the government.

The harbour at Trenton is much larger, and superior to that at Port Hope, and terminates in the inland waters of the Bay of Quinte.

For the above reasons I consider that the Trenton route is the most suitable for the canal.

HENRY A. F. MACLEOD, *M. Inst. C.E.*

TRENT CANAL.

HEELY'S FALLS.—ESTIMATE OF COST.

Description.	Unit.	Quantity.	Rate.	Amount.
			$ cts.	$ cts.
Rock excavation in Prism, Lock pits, &c	C. Yds.	146,737	1 00	146,737
Concrete in Locks (8)	"	30,448	6 00	182,688
White Oak in Lock Sills	F.B.M.	48,000	80 00	3,840
Iron in Lock Sills	Lbs.	13,176	0 10	1,318
Douglas Fir, in Lock Gates	F.B.M.	275,100	70 00	19,257
Iron, wrought and cast, in Lock Gates, including valves and operating gear	Lbs.	483,530	0 10	48,353
Dowels in Gates	No.	708	0 50	354
Steel Rope, for operating Gates	Ft.	640	0 25	160
White Oak in Guard Gate	F.B.M.	4,246	80 00	340
White Pine " "	"	1,975	30 00	59
Iron in Guard Gate, including valves	Lbs.	3,416	0 10	342
Concrete in Guard Gate	C. Yds.	20	6 00	120
Earth Embankment—Borrow	"	54,755	0 30	16,427
Rock excavation for embankment	"	21,511	1 00	21,511
Rock excavation in Silt Chambers (7)	"	1,001	1 00	1,001
Concrete in " "	"	420	6 00	2,520
Crib-work in Entrance piers	"	16,928	3 50	59,248
Concrete " "	"	9,116	6 00	54,696
White Oak " "	F.B.M.	85,600	80 00	6,848
Iron " "	Lbs.	36,648	0 10	3,665
Rock excavation in Dam foundation	C. Yds.	696	1 00	696
Concrete in Dam	"	5,277	6 00	31,662
Timber and Plank in Dam	F.B.M.	107,300	30 00	3,219
Iron in Dam	Lbs.	97,240	0 10	9,724
Stop-Logs in Dam	F.B.M.	40,600	40 00	1,624
Gravel "	C. Yds.	1,900	1 00	1,900
Rails "	Lbs.	5,840	0 10	584
Spikes "	"	80	0 10	8
Winches "	"	2,650	0 10	265
Chain for Winches in Dam	"	108	0 10	11
Concrete in Bridge abutments and piers	C. Yds.	250	6 00	1,500
White Oak " " "	F.B.M.	2,000	80 00	160
Superstructure, one Swing Bridge	.....	.....	.....	5,000
Right of Way	Acres.	40	40 00	1,600
Unwatering and removing old dams	.....	.....	.....	15,000
Fencing	Ft.	8,000	0 10	800
Painting Lock Gates, 16 pairs	1 pair.	16	500 00	8,000
Excavation in Roads	C. Yds.	4,300	0 30	1,290
Gravel "	"	3,700	1 00	3,700
Concrete in walls of Reaches	"	6,348	6 00	38,088
Rock excavation for walls of Reaches	"	2,781	1 00	2,781
				697,096
Add 10% for Contingencies	.....	.....	.....	69,710
				766,806

HENRY A. F. MACLEOD.

TRENT CANAL.

ESTIMATE OF COST OF CONSTRUCTION *via* PORT HOPE AND *via* TRENTON.

Rice Lake and Port Hope Route		$ 4,918,079
Hastings and Trenton Route :—		
Reaches above and below Hastings	$ 21,000	
Heely's Falls Section	766,806	
Hoard's Creek Section	2,360,250	
Chisholm's Lock	219,560	
Frankford-Trenton Section	1,695,000	
		5,062,616
Difference in favour of Port Hope Route		$ 144,537

HENRY A. F. MACLEOD.

TRENT CANAL.

Rice Lake to Port Hope.—Estimate of Cost.

Description.	Unit.	Quantity.	Rate.	Amount.
			$ cts.	$ cts.
Rock excavation, in prism, lock pits, &c.	C. Yds	174,736	1 00	174,736
Earth " "	"	5,101,696	0 30	1,530,509
Concrete in locks (19)	"	122,493	7 00	857,451
White oak in lock sills	F.B.M.	114,000	80 00	9,120
Iron in lock sills	Lbs.	31,293	0 10	3,129
Douglas Fir in lock gates	F.B.M.	885,500	70 00	61,985
Iron, wrought and cast, in lock gates (including valves, &c., operating gear)	Lbs.	1,293,270	0 10	129,327
Dowels in gates	No.	2,330	0 50	1,165
Steel rope, for operating gates	Ft.	1,280	0 25	320
White oak in guard gates (2)	F.B.M.	8,492	80 00	679
White pine in guard gates	"	3,950	30 00	118
Iron in guard gates, including valves	Lbs.	6,832	0 10	683
Concrete in guard gates	C. Yds.	200	7 00	1,400
Earth excavation in silt chambers (5)	"	715	0 30	214
Concrete in silt chambers	"	300	7 00	2,100
Crib-work in entrance piers	"	44,632	4 00	178,528
Concrete "	"	17,896	7 00	125,272
White oak "	F.B.M.	170,800	80 00	13,664
Iron " superstructure	Lbs.	71,824	0 10	7,182
Rock excavation in dams	C. Yds.	30,970	1 00	30,970
Earth " "	"	15,918	0 30	4,775
Concrete in dams	"	52,543	7 00	367,801
Timber and plank in dams	F.B.M.	338,180	30 00	10,145
Iron " "	Lbs.	193,570	0 10	19,357
Stop logs " "	F.B.M.	78,000	40 00	3,120
Gravel " "	C. Yds.	15,360	1 00	15,360
Rails " "	Lbs.	12,000	0 10	1,200
Spikes " "	"	180	0 10	18
Winches " "	"	21,200	0 10	2,120
Chains for winches	"	864	0 10	86
Earth excavation in bridge foundation	C. Yds.	21,400	0 30	6,420
Concrete in bridge abutments and piers	"	9,665	7 00	67,655
Masonry " "	"	4,900	10 00	49,000
White oak " "	F.B.M.	20,144	80 00	1,612
Superstructure in 18 bridges				112,600
Right of way	Acres.	356	40 00	14,240
"	"	18	200 00	3,600
Buildings on right of way (15)				22,00
Unwatering and removing old dams, &c				8,000
Fencing	Ft.	120,800	0 10	12,080
Clearing	Acres.	110	30 00	3,300
Painting lock-gates	1 pair.	38	500 00	19,000
Harbour at Port Hope				350,000
Excavation in protection of banks	C. Yds.	63,600	0 30	19,080
Stone filling " "	"	63,600	3 00	190;800
Excavation in roads	"	32,200	0 30	9,660
Gravel in roads	"	27,600	1 00	27,600
Right of way for roads	Acres.	45	40 00	1,800
				$4,470,981
Add 10% for contingencies				447,098
				$4,918,079

HENRY A. F. MACLEOD.

TRENT CANAL.

REACHES ABOVE AND BELOW HASTINGS.—ESTIMATE OF COST.

Description.	Unit.	Quantity.	Rate.	Amount.
			$ cts.	$ cts.
Above lock at Hastings	C. Yds.	7,500	2 00	15,000
Below lock at Hastings	"	3,000	2 00	6,000
				$ 21,000

HENRY A. F. MACLEOD.

TRENT CANAL.

HOARD'S CREEK SECTION.—ESTIMATE OF COST.

Description.	Unit.	Quantity.	Rate.	Amount.
			$ cts.	$
Rock excavation in prism, lockpits, &c.	C. yds.	1,015,843	1 00	1,015,843
Earth embankments, borrow	"	315,111	0 30	94,534
Rock excavation for embankment	"	72,948	1 00	72,948
Concrete in locks (14)	"	55,806	6 00	334,836
White oak in lock sills	F. B.M.	84,000	80 00	6,720
Iron in lock sills	Lbs.	23.058	0 10	2,306
Douglas fir in lock gates	F. B.M.	486,600	70 00	34,062
Iron, wrought and cast, in lock gates (including valves, &c., and operating gear)	Lbs.	849,100	0 10	84,910
Dowels in gates	No.	1,256	0 50	628
Steel rope, for operating gates	Ft.	1,120	0 25	280
White oak in guard gates (3)	F. B.M.	12,900	80 00	1,032
White pine " "	"	6,000	30 00	180
Iron in guard gates, including valves	Lbs.	10,500	0 10	1,050
Concrete in guard gates	C. yds.	60	6 00	360
Rock excavation in silt chambers (12)	"	1,800	1 00	1,800
Concrete in " "	"	720	6 00	4,320
Cribwork in entrance piers	"	26,728	3 50	93,548
Concrete in " "	"	14,836	6 00	89,016
White oak in " "	F. B.M.	144,400	80 00	11,552
Iron in " "	Lbs.	59,792	0 10	5,979
Rock excavation in dam foundation	C. yds.	1,400	1 00	1,400
Concrete in dam	"	6,695	6 00	40,170
Timber and plank in dam	F. B.M.	117,500	30 00	3,525
Iron in dam	Lbs.	96,815	0 10	9,681
Stop logs in dam	F. B.M.	40,600	40 00	1,624
Gravel "	C. yds.	2,528	1 00	2,528
Rails "	Lbs.	5,840	0 10	584
Spikes "	"	80	0 10	8
Winches "	"	2,650	0 10	265
Chain for winches in dam	"	108	0 10	11
Concrete in bridge abutments and piers	C. yds.	4,225	6 00	25,350
White oak " " "	F. B.M.	12,500	80 00	1,000
Superstructure—9 swing bridges	.....	.....	.....	45,500
Rock excavation in bridges	C. yds.	2,600	1 00	2,600
Masonry in Grand Junction railway bridge	"	1,100	10 00	11,000
Rock excavation in stream diversions	"	38,700	1 00	38,700
Right of way	Acres.	170	40 00	6,800
Unwatering	.....	.....	.....	30,000
Fencing	Ft.	94,000	0 10	9,400
Painting lock gates	1 pair.	28	500 00	14,000
Excavation in roads	C. yds.	25,000	0 30	7,500
Gravel in roads	"	20,900	1 00	20,900
Concrete in wall, at Middle Falls entrance	"	2,560	6 00	15,360
Rock excavation for same	"	370	1 00	370
Clearing	Acres.	50	30 00	1,500
				2,145,680
Add 10% for contingencies	.....	.....	.....	214,570
				2,360,250

HENRY A. F. MACLEOD.

CHISHOLM'S LOCK.—ESTIMATE OF COST.

Description.	Uuit.	Quantity.	Rate.	Amount.
Pulling down and rebuilding lock, in part, 10′ lift				
Present lock is 135′ between quoins, or 7′ (short)				
Masonry	C. yds.	2,000	12 00	24,000
2 pairs of gates, valves, painting, &c				9,500
1 guard gate				880
1 slit chamber				500
4 entrance piers				61,100
New dam				59,800
1 railway and 1 highway bridge, swing				32,000
Right of way	Acres.	8	40 00	320
Unwatering dam, &c				10,000
Fencing	Ft.	2,000	0 10	200
Road				1,300
				199,600
Add 10% for contingencies				19,960
				219,260

HENRY A. F. MACLEOD.

TRENT CANAL.

TRENTON—FRANKFORD SECTION—ESTIMATE OF COST.

Description.	Unit.	Quantity.	Rate.	Amount.
			$ cts.	
Rock excavation, in prism, lockpits, &c.	C. Yds.	376,211	1 00	376,211
Concrete in locks, (7)	"	36,047	6 00	216,282
White oak in lock sills..	F.B.M.	42,000	80 00	3,360
Iron in lock sils..	Lbs.	11,529	0 10	1,153
Douglas fir in lock gates.	F.B.M.	301,500	70 00	21,105
Iron, wrought and cast, in lock gates, (including valves, &c., and operating gear)	Lbs.	460,490	0 10	46,049
Dowels in gates.	No.	796	0 50	398
Steel rope for operating gates	Ft.	560	0 25	140
Rock excavation in silt chambers (7)	C. Yds.	1,050	1 00	1,050
Concrete in same	"	426	6 00	2,556
Crib-work in entrance piers	"	30,550	3 50	106,925
Concrete " "	"	12,836	6 00	77,016
White oak " "	F.B.M.	134,200	80 00	10,736
Iron " "	Lbs.	60,892	0 10	6,090
Rock excavation in dams	C. Yds.	6,239	1 00	6,239
Concrete in dams	"	35,283	6 00	211,698
Timber and plank in dams	F.B.M.	756,900	30 00	22,707
Iron in dams	Lbs.	676,020	0 10	67,602
Stop logs in dams	F.B.M.	284,200	40 00	11,368
Gravel "	C. Yds.	18,185	1 00	18,185
Rails "	Lbs.	40,880	0 10	4,088
Spikes "	"	560	0 10	56
Winches "	"	18,550	0 10	1,855
Chain for winches in dams.	"	756	0 10	76
Concrete in watertight walls.	C. Yds.	15,968	6 00	95,808
Earth embankment (borrow)	"	24,940	0 30	7,482
Rock excavation for concrete walls.	"	3,950	1 00	3,950
Rock excavation for earth embankment.	"	5,000	1 00	5,000
Concrete in bridge abutments and piers	"	3,900	6 00	23,400
Masonry in Grand Trunk abutments	"	2,860	10 00	28,600
Rock excavation in bridge foundation	"	5,430	1 00	5,430
Superstructure 4 bridges and trestle.				31,800
White oak fenders	F.B.M.	3,700	80 00	296
Raising old iron bridge.				1,000
Removing two old spans and piers				1,160
Earth embankment	C. Yds.	21,370	0 30	6,411
Gravel	"	300	1 00	300
Ballast	"	600	0 30	180
Right-of-way	Acres.	88	40 00	3,520
" "	"	12	100 00	1,200
Unwatering.				92,000
Fencing	Lin. Ft.	15,800	0 10	1,580
Painting lock gates	1 pair.	14	500 00	7,000
Excavation in roads	C. Yds.	19,180	0 30	5,754
Gravel in roads	"	6,100	1 00	6,100
				1,540,916
Add 10% for contingencies				154,084
				1,695,000

HENRY A. F. McLEOD.

OTTAWA, August 8, 1903.

COLLINGWOOD SCHREIBER, Esq., C.M.G.

Re TRENT CANAL ESTIMATES.

I have been revising the estimates made by Mr. Rogers and myself of the Port Hope and Trenton sections, of the Trent canal, and now beg to enclose tabulated statements, giving the amounts estimated for the various classes of work, by Mr. Rogers and myself, in parallel columns, and the excess of either, in adjoining columns.

TRENTON—FRANKFORD SECTION.

In reference to the Trenton-Frankford estimate made by Mr. Rogers, I don't think he could have intended it for a complete estimate of the whole cost of the section, because he has apparently left out the cost of cement, for concretes, also bridge superstructures, and the usually large item for contingencies.

My estimate for the section is more than double the amount of Mr. Rogers estimate.

The three items above mentioned, account for over $400,000, or nearly one half the excess of my estimate. Added to this, my estimate for concrete exceeds Mr. Rogers by 23,460 cubic yards, or $140,760 at $6 per yard.

The other items in which my estimate is largely in excess are as follows:—

Rock Excavation.—From the appearance of the ground, I estimated all the excavation in rock. There is no dividing line on the profile to separate the rock from earth. My rock excavation includes deep lock pits, the sills being 8 feet 4 inches below the water level. Excavations for foundations of dams, water-tight concrete walls, earth embankments and bridges.

Mr. Rogers' earth excavation exceeds mine, which, only covers earth borrowed from embankments.

Timber.—If my excess of $49,742 in items 8, 9 and 10 is taken from Mr. Rogers' excess of $69,515 in items 11, 12, 13, 14, 18, 19, 20, 21, 22, 23, 28 and 29 it leaves an excess in Mr. Roger's estimate of $19,773. Without the detail of Mr. Rogers' estimate I cannot assign the various items to the entrance piers and dams.

Wrought and Cast Iron.—My price for iron is nearly double those in Mr. Rogers' estimate. I do not think that my quantities are excessive.

Stone Filling.—The difference in our prices $1.60 will nearly make up the excess in my estimate.

Unwatering.—Nearly half of the excess of $62,000 is intended to cover the cost of rock excavation (under 8 feet of water in part), to make the price $2 per cubic yard at the Trenton entrance. Some of the dams and locks are also in deep water.

Gravel in Dams.—The excess of $5,000 in Mr. Rogers' estimate for broken 'stone or gravel,' item 64, may be taken from my excess of $18,185 for gravel in dams.

A large quantity of gravel is required to comply with the plan for concrete dams, which is the only plan for dams used in my estimate.

Right of Way.—I have also included $4,720 for right of way.

There are several small items in Mr. Rogers' estimate for clearing, erecting gates, mooring posts, stone pitching, puddle, soiling slopes, protection lining, drilling holes, road guards, removing old fences, tiles, and days labour, amounting to $28,112, of which I have taken no account. I think it is unnecessary to include protection lining, as the banks are protected by the entrance piers, and are in rock cuttings, also drilling holes, and days labour, amounting to $14,875, the balance $13,237, is covered in my item for contingencies.

Port Hope Section.

My estimate for the Port Hope section exceeds Mr. Rogers, by over a million dollars. Mr. Rogers estimate for locks, exceeds mine by $506,300, which is caused by the cost of two hydraulic lift-locks.

In all other items my estimate is the larger as follows :—

Rock Excavation.—The excess is caused by the difference in price, and the cost of a deviation of Smith's Creek at Lock 11.

Earth Excavation.—The difference in price more thau accounts for the excess.

Lock Gates.—Mr. Rogers' estimate is for 24 pairs of gates at $4,000. Mine for 36 pairs over $5,000, the average price of the gates estimated. I have also added $19,000 for painting. I changed the two hydraulic lift locks into six ordinary lift locks, which accounts for the difference in the number of lock gates,

Guard Gates and Silt Chambers are not included in Mr. Rogers' estimate.

Entrance Piers.—I have estimated 3,000 lin. feet of entrance piers, more than Mr. Rogers', to comply with the plans. My estimate include 2,800 feet of piers at the Rice lake entrance and additional crib-work, where the water will exceed six feet deep, at the lock entrances.

Bridges.—I have estimated for the same number of bridges (18) as Mr. Rogers. My estimate is $26,287 in excess of his.

Dams.—My largest excess is in the estimate for dams. I made a diagram for each dam from the profile and plan and calculated the 8 dams separately, in accordance with the plan for concrete dams, and do not think that my estimate is too large.

Mr. Rogers has not estimated the following items—Land, and buildings on same—unwatering and removing old dams—Fencing and clearing—Protection of banks—and Roads—all of which, in my estimate, amount to $312,160.

My estimate for the Port Hope harbour and for contingencies are in excess of his.

Frankford to Rice Lake,

My estimate for the portion of the Trenton route, from Frankford to Rice lake, is $3,367,615. Mr. Rogers' estimate taken from Rubidge's, but not including repairs at Chisholms Rock, and deepening the channel at Hastings, is $2,078,563, showing that mine is $1,289,053 in excess.

In reference to this difference I would make the following remarks in explanation.

Chisholm's Lock.—I have estimated $219,560 for Chisholm's lock, made up of the following items. Pulling down and rebuilding part of the lock masonry, $24,000 2 pairs of gates, valves, &c., and painting, $9,500,—Guard gate $880.—Silt chamber $500. 4 Entrance piers $61,100. New dam $59,800.—Swing bridges, 1 railway and 1 highway, $32,000.—Right of Way $320.—Unwatering dam and lock $10,000.—Fencing $200.—Road $1,300.—The above are not included in Mr. Rogers' estimate.

It may be found that the old timber dam can be repaired and lessen the cost.

Hoard's Creek Section.

My estimate for the Hoard's creek section is made upon the same scale as the Trenton-Frankford section. The estimate made by Mr. Rubidge in 1888 is no doubt upon a smaller scale, particularly in the size of locks, which would not have then 8′ 4″ of water on the sills. I have not compared my items in detail with Mr. Rubidge's estimate, but I have revised my estimate, and think it is not excessive.

The prism and lock pits are estimated entirely in rock. There is no line shown on profile to indicate earth, and there appeared to be very little earth in the stream buttom. The prism is widened in nine places to 100 feet, this does not appear to be done in Mr. Rubidge's plan, and the lock pits are deep for 8′ 4″ water on the sills.

I think the cost of the section would be considerably reduced by introducing some dams instead of excavating the prism, increasing the lift of some of the locks and redncing the number.

There are now 14 locks proposed, with 2 of 9 feet lift, 4 of 10 feet, 1 of 11 feet, 5 of 12 feet, 1 of 13 feet and 1 of 14 feet This would also effect a saving in water-tight earth embankments, and rock excavation below them, and would save the greater part of what I estimate for stream diversions.

In entrance piers my estimate provides for 400 lin. feet at each side of the entrance at Middle falls, and at Perry reach, and 52 entrance piers to the locks, each 150 feet long.

The dam at the Middle fall is estimated on a sketch I made of the river, taken from the plan and profile, and my knowledge of the locality.

Unwatering.—$30,000—includes $20,000 to make the price of rock excavation, under water, equal to $2 per cubic yard.

The balance is principally for the dam.

The other items require no explanation.

Heeley's Falls Section.

Most of my remarks in reference to Hoard's creek section apply to the Heely falls section. It is entirely in rock.

I don't think it would be advisable to have more than one dam. That which I estimate is on the site of the present dam, and is taken from my sketch, compiled from the plan and profile. It may be found that the present dam can be made sufficient, and thus save about $50,000.

I think that the number of locks, proposed in this section, might be reduced to advantage, there being 8 locks of the following lifts : 2 of 6 feet lift, 3 of 8 feet, 2 of 14 feet and 1 of 15 feet.

I have also estimated for one guard gate, and seven silt chambers.

For entrance piers I include 400 feet at each side of the entrance, at the upper and lower reaches, and 24 piers at entrance to locks each 150 feet long.

The unwatering $15,000, includes $10,000 for the new dam, $2,000 for locks 1 to 5, $2,000 for the concrete walls, and $1,000 for the lower entrance.

Other items are for a highway swing bridge, right of way, fencing, painting lock gates, roads, and water-tight concrete walls.

Lock Gates and Dams.—I may say that I made tables giving the quantities in locks, and gates for lifts of from 8 feet to 22 feet, one set for locks founded on rock, the other for locks on earth.

The estimate includes sills and bolts, lock gates and fastenings, girders, valves and geering, and operating machinery for the gates.

The dams include the quantities in sluice-ways, girders, stop-logs and winches, with the concrete in dams, piers, and abutments, also the bridging between piers.

HENRY A. F. MACLEOD, *M. Inst. C.E.*

TRENT CANAL—TRENTON-FRANKFORD SECTION.

Comparison of Estimates made by Mr. R. B. Rogers and H. A. F. Macleod.

Description.	Rogers.	Macleod.	Excess.		Remarks.
			Rogers.	Macleod.	
Item.	$ cts.	$ cts.	$ cts.	$ cts.	Prices.
Clearing, grubbing, 1-2	2,500 00	Nil.	2,500 00		
Earth excavation, 3	62,500 00	13,893 00	48,607 00		R. 25c. M. 30c.
Ballast on railway, 4	1,300 00	180 00	1,200 00		R. $1. M. 30c.
Rock excavation, 5	144,000 00	397,880 00		253,880 00	R. 90c. M. $1.
Concrete, 6	267,300 00	626,760 00		359,460 00	R. $3.90. M. $6.
Ashlar masonry, 7	36,000 00	38,600 00	7,400 00		R. $9. M. $10.
Timber in entrance piers, 8-9-10	564 00	50,306 00		49,742 00	R. $22 & $15.08. M. $30
White pine, &c., 11-12-13-14-18-19-20-21-22-23-28-29	103,590 00	34,075 00	69,515 00		R. $16 to $50. M. $30 to $40.
White oak, 15-16-17	14,225 00	14,392 00		167 00	R. $71 to $75. M. $80.
Tiles, 24-25-26-27	Nil.	Nil.			
Douglas fir, 30	24,000 00	21,105 00	2,895 00		R. $50. M. $70.
Dowels, 31	45 00	398 00		353 00	R. 3c. M. 50c.
Wrought and cast iron, 32-33-34-35-36-37-38-42-43-44-45-51-52-53	68,410 00	127,693 00		59,283 00	R. 5c. to 10c. M. 10c.
Painting gates, 39-40	775 00	7,000 00		6,225 00	R. $52. M. $500.
Erecting gates, 41	1,050 00	Nil.	1,050 00		R. $75.
Mooring posts, cast iron, 46-47-48	870 00	Nil.	870 00		R. 6c.
Rails for winches, 49	805 00	4,088 00		3,283 00	R. $35 p. ton. M. 10c.
Chain, 50	150 00	76 00	74 00		R. 5c. M. 10c.
Stone pitching, 54	1,800 00	Nil.	1,800 00		R. $3.
Stone filling, 55	9,600 00	51,731 00		42,131 00	R. 40c. M. $2.
Puddle, 56	2,000 00	Nil.	2,000 00		R. $1.
Soiling, &c., 57-58	1,380 00	Nil.	1,380 00		R. 12c. to 18c.
Grading roads, 59	5,000 00	5,754 00		754 00	R. $25. M. 42.60.
Protection lining, 60 61-62	7,500 00	Nil.	7,500 00		R. 60c. to $3.
Drilling holes, 63	5,000 00	Nil.	5,000 00		R. 25c.
Broken stone or gravel, 64	11,400 00	6,400 00	5,000 00		R. 95c. M. $1.
Fencing and gates, 65-66-67-68	884 00	1,580 00		696 00	R. $2 & $14. M. $1.65.
Timber guards and ties, 69-70-71	1,677 50	Nil.	1,677 50		
Removing old frames, 72	460 00	Nil.	460 00		
Drain tiles, 73	500 00	Nil.	500 00		
White oak mooring posts, 75	1,000 00	Nil.	1,000 00		
Conveying and placing bridges, 76	3,000 00	2,160 00	840 00		
Unwatering, 77	30,000 00	92,000 00		62,000 00	
Day's labour, 78-79-80-81-82	2,375 00	Nil.	2,375 00		
Superstructure of bridges and trestles	Nil.	31,800 00		31,800 00	G. T. Railway double track Gilmour siding and Frankford bridge.
Gravel in dams	Nil.	18,185 00		18,185 00	
Steel rope for gate capstones	Nil.	140 00		140 00	
Right of way	Nil.	4,720 00		4,720 00	
Contingencies	Nil.	154,084 00		154,084 00	
Total	811,660 50	1,695,000 00	163,563 50	1,046,903 00	
	883,339 50			163,563 50	
	1,695,000 00			883,339 50	

HENRY A. F. MACLEOD.

TRENT CANAL—PORT HOPE SECTION.

Comparison of Estimates made by Mr. R. B. Rogers and H. A. F. Macleod.

Description.	Rogers.	Macleod.	Excess.		Remarks.
			Rogers.	Macleod.	
	$ cts.	$ cts.	$ cts.	$ cts.	
Rock excavation	120,000 00	174,736 00		54,736 00	R. 75c. M. $1.
Earth excavation	1,210,000 00	1,530,509 00		320,509 00	R. 22c. M. 30c.
Locks	1,376.000 00	869,700 00	506,300 00		Rogers includes 2 hyd. locks.
Lock gates	96,000 00	211,797 00		115,797 00	R. $4,000. M. $500 and painting.
Guard gates	Nil.	2,880 00		2,880 00	
Silt chambers	Nil.	2,314 00		2,314 00	
Entrance piers	91,200 00	324,464 00		233,446 00	R. 7,600 l. ft. M. 10,-600 l. ft.
Bridges	211,000 00	237,287 00		26,287 00	
Dams	120,000 00	454,952 00		334,952 00	
Land and buildings	Nil.	39,840 00		39.840 00	15 houses and right of way.
Unwater and removing old dams	Nil.	8,000 00		8,000 00	
Fencing and clearing	Nil.	15,380 00		15,380 00	
Harbour, Port Hope	300,000 00	350,000 00		50,000 00	
Protection of banks	Nil.	209,880 00		209,880 00	
Roads	Nil.	39,060 00		39,060 00	
Contingencies	337,320 00	447,098 00		109,778 00	
Total	3,861,520 00	4,918,079 00	506,300 00	1,562,859 00	
	1,056,559 00			506,300 00	
	4,918,079 00			1,056,559 00	

HENRY F. MACLEOD.

OTTAWA, September 29, 1903.

COLLINGWOOD SCHREIBER, Esq., C.M.G.,

Re TRENT CANAL, PORT HOPE AND TRENTON ROUTES.

You directed me, on the 14th of August, to meet Mr. Robert Beith, M.P., at Port Hope, and to take with me the plans of the Trent canal, showing the two routes proposed from Rice Lake, via Port Hope, and via Trent river, and Trenton.

According to arrangement, I met Mr. Beith at Port Hope on the 22nd of August, and with him Dr. Powers, Messrs. Clarke, Mullholland, Corbet and Barrett, examined the plans of the two routes, and spoke about the comparative difficulties of each.

In my letter to you of the 15th of May, in reference to the Port Hope route, I said that I did not think it would be necesssary for the canal to cross the Grand Trunk Railway on the way in and that it could pass under the viaduct at Port Hope.

My report and estimates of the two routes of the 25th of July, are based upon the plans in the possession of the department, and my examination on the ground.

On the Port Hope route, as shown on the plans, the canal crosses the Grand Trunk twice, and the people of Port Hope wished to have a survey made, to show that it is unnecessary to cross the railway between Rice lake and Port Hope.

I mentioned this to you on my return to Ottawa on the 25th August.

Even should it be found that the two crossings can be dispensed with, I still think that the advantages of the Trenton route, are very largely in favour of its being adopted, as in my report of the 25th of July.

My estimates for the two routes, are largely in excess of those made by Mr. Rogers, and I wrote to you on the 8th of August, pointing out the causes of difference, which are mainly due to the higher prices used in my estimates.

All my estimates, however, are made upon one scale, while some of Mr. Rogers' are taken from Mr. Rubidge's estimates made several years ago.

HENRY A. F. MACLEOD, *M. Inst. C.E.*